

(12) UK Patent Application (19) GB (11) 2 252 501 (13) A
(43) Date of A publication 12.08.1992

(21) Application No 9202366.2

(22) Date of filing 04.02.1992

(30) Priority data

(31) 91020429

(32) 05.02.1991

(33) GB

(71) Applicants

Phillip Anthony Evans
12 Methley Drive, Chapel Allerton, Leeds,
West Yorkshire, LS7 3NE, United Kingdom

Paul Harrison
11 Rochester Terrace, Headingley, Leeds,
West Yorkshire, LS6 3DF, United Kingdom

John Fisher
Dept of Mechanical Engineering, University of Leeds,
Woodhouse Lane, Leeds, LS2 9JT, United Kingdom

Christopher John Watson
Dept of Restorative Dentistry, University of Leeds,
Woodhouse Lane, Leeds, LS2 9JT, United Kingdom

(51) INT CL⁵
A61C 8/00

(52) UK CL (Edition K)
A5R RDJ

(56) Documents cited
GB 2210795 A GB 1431563 A EP 0343135 A
US 4904187 A US 4723913 A US 4304553 A

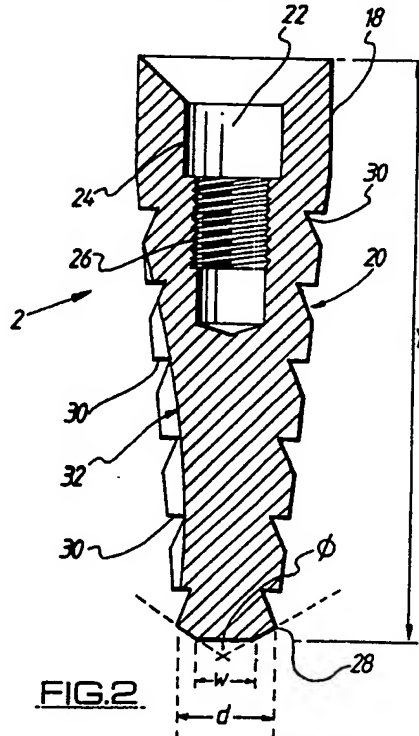
(58) Field of search
UK CL (Edition K) A5R RDJ
INT CL⁵ A61C 8/00 13/30

(72) Inventors
Phillip Anthony Evans
Paul Harrison
John Fisher

(74) Agent and/or Address for Service
Anthony Watson & Co
26 Sutherland Avenue, Roundhay, Leeds, LS8 1BZ,
United Kingdom

(54) Root section for a dental implant

(57) The root section comprises a proximal neck portion 18 having parallel-sided walls, an apex 28 of hemi-spherical or truncated conical form, and an intermediate portion 20 having a plurality of recesses 30 of predetermined form. The intermediate portion may be of tapered form and may include one or more anti-rotational slots. The root section may be composed of a bio compatible titanium based or fibre-reinforced polymer material and may have a thermally sprayed coating of hydroxy apatite.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 252 501 A

1-2

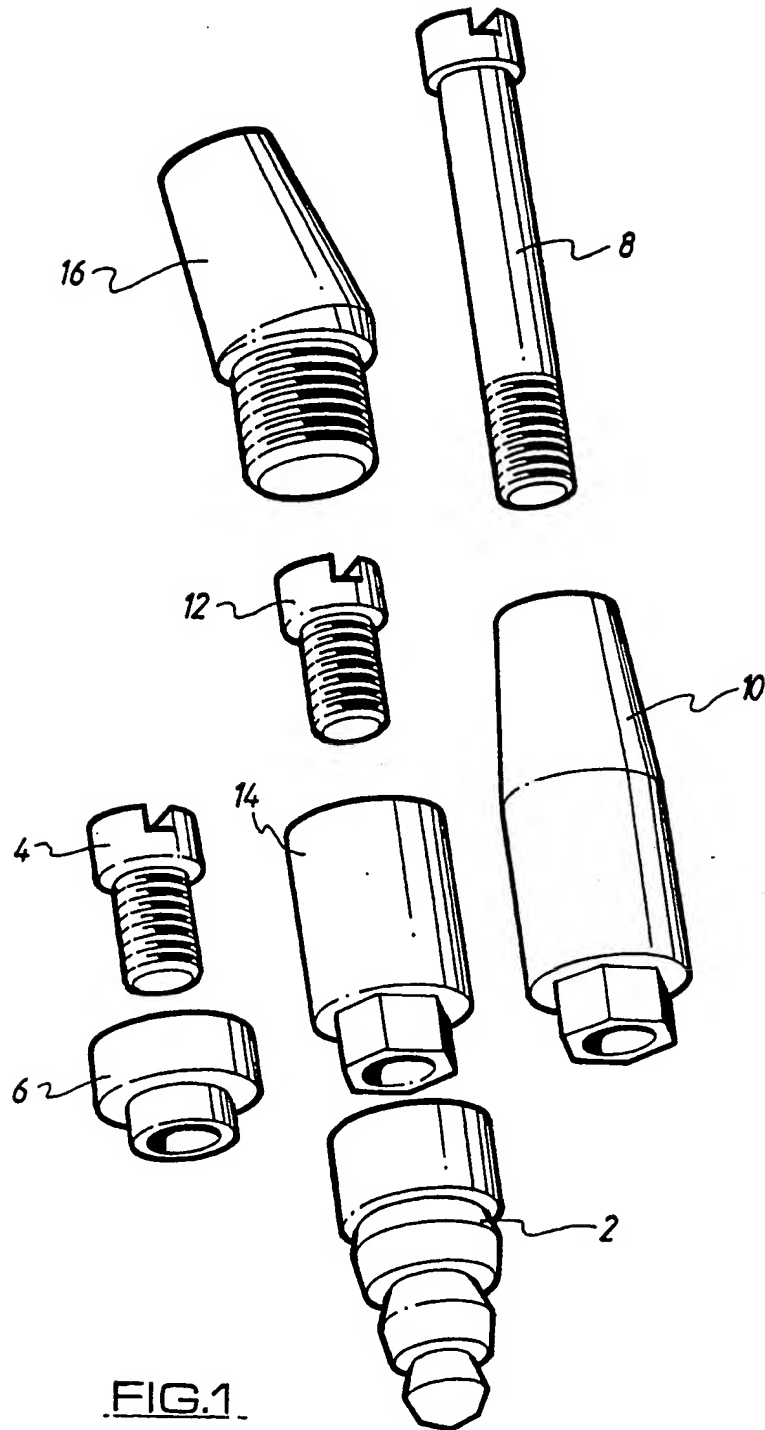


FIG.1

2-2

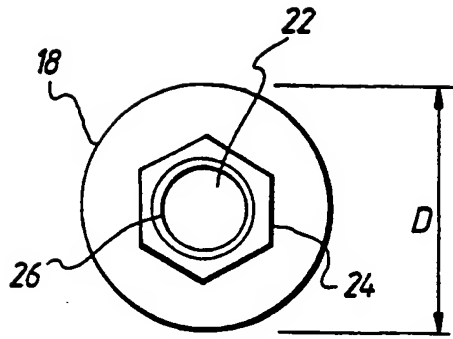


FIG. 3

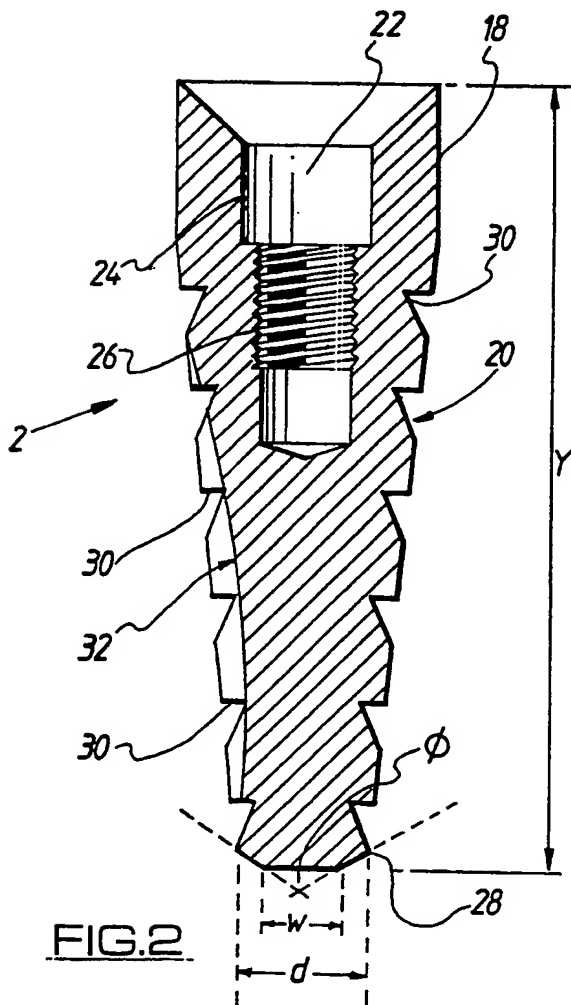


FIG. 2

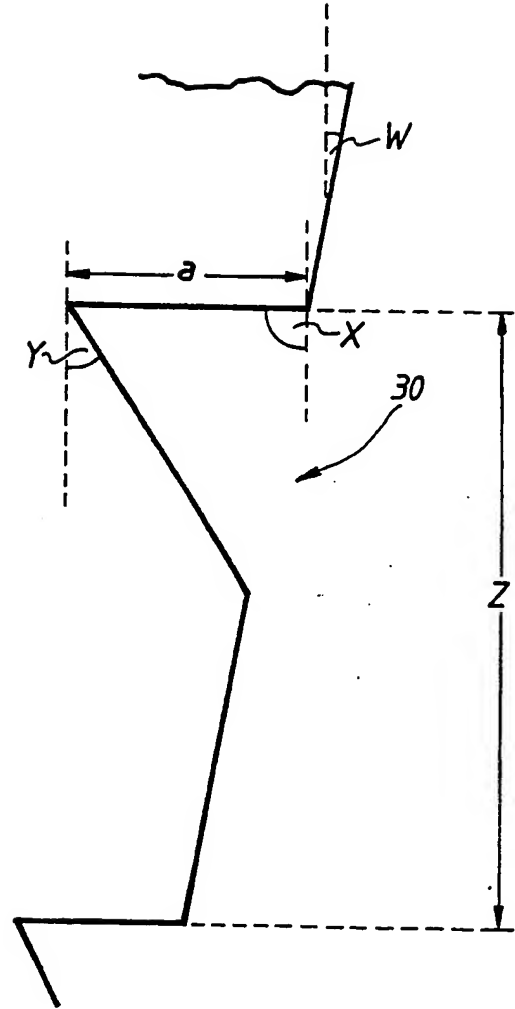


FIG. 4

DENTAL IMPLANTS

This invention relates to dental implants and more particularly to root sections for dental implants.

05

The invention seeks to provide an improved form of root section for dental implants which will enhance the longer term stability of the implant by modifying the stress distribution within the alveolar bone structure, serving to maintain a healthy bone/implant interface, and which will simplify clinical procedures for the placement of implants.

According to the present invention there is provided a root section for dental implants comprising a proximal neck portion having parallel-sided walls, an apex of hemispherical or truncated conical form, and an intermediate portion having a plurality of recesses of predetermined form.

20

The intermediate portion will preferably be of tapered form, and may include one or more anti-rotational slots.

The root section will preferably be composed of a biocompatible titanium based or fibre reinforced polymer material, and the root section may be provided with a thermally sprayed coating of Hydroxy Apatite.

25

In order that the invention may be more readily understood, an embodiment thereof will now be described, by way
05 of example, reference being made to the accompanying drawings, wherein:-

Figure 1 shows the component parts of a dental implant including a root section in accordance with the invention;
Figure 2 is a longitudinal sectional elevation, to a
10 larger scale, of the root section of Figure 1;
Figure 3 is a plan view on Figure 2; and
Figure 4 is an enlarged detail view of the encircled part of the root section shown in Figure 2.

15 Referring to the drawings, and firstly to Figure 1, the various component parts of a dental implant are referenced 2, 4, 6, 8, 10, 12, 14, and 16, where the component part 2 is the root section of the implant, and component parts 4 and 6 are protection members which are used temporarily
20 and which are only in place relative to the root section 2 during the healing-in period to protect the internal bore of the root section 2. Component parts 8 and 10 represent the transmucosal components of a straight design and the component parts 12, 14, and 16 represent the transmucosal
25 components of an angled design. The component parts 4 through 16 form no part of the inventive concept of the present invention and will therefore not be described in

greater detail herein.

05 Referring now to Figures 2 and 3, which show the root
section 2 of Figure 1 in greater detail, a proximal neck
portion 18 of the root section is parallel-sided in order
to reduce stress concentration in this area which is in
contact with cortical bone. As will be seen, the root
10 section 2 includes an intermediate portion 20 which is
generally tapered, such taper resulting in the largest
diameter at the proximal neck portion 18 so as to reduce
stresses in this region. The proximal neck portion 18 has
an external diameter D which is variable and which lies in
15 the range 2mm to 6mm, and is cored as indicated by the
reference numeral 22. The design or form of the core
section is such that the transmucosal components 10 or 14
are fixed in position once located relative to the root
section. The core may consist of an hexagonal portion 24
20 for location of the transmucosal components and a threaded
portion 26 to secure said components or a bored hole to
allow cementation of said components.

In order to promote uniform stress distribution and
25 transfer of load in compression, the apex 28 of the root
section 2 is of truncated conical form with an inclusion
angle \emptyset of 100° to 150° and a flat w of length 0.5mm to

1.5mm. The diameter d at the base of the apex lies in the range 2.0mm to 3.0mm.

05

Instead of the apex 28 being of truncated conical form, it may be of hemi-spherical form having a radius of curvature lying in the range 0.5mm to 1.5mm.

10

The length y of the root section 2 will lie in the range 8mm to 20mm, and located along the length of the root section, and between the proximal neck portion 18 and the apex 28, are a number of recesses 30. These recesses, which are provided for promotion of uniform stress

15

distribution with transverse faces transmitting load in compression, will be variable in number, the number being dependent upon the length y of the root section 2. In a preferred embodiment of the invention, there will be two to fifteen such recesses.

20

One of the recesses 30 is shown in greater detail in Figure 4 and has the following characteristics:

25

Angle <u>W</u>	-	1° to 30°
Angle <u>X</u>	-	70° to 90°
Angle <u>Y</u>	-	0° to 60°
Length <u>a</u>	-	0.2mm to 1.00mm
Length <u>z</u>	-	0.5mm to 5.00mm

In order to prevent rotation following the healing-in period, the root section 2 incorporates an anti-rotational longitudinal slot 32 which will be machined into the recesses and which will have a depth lying in the range 0.1mm to 0.75mm. It will be appreciated that there may be more than one such anti-rotational slot.

All the component parts of the implant, including the root section 2, will be composed of a bio-compatible titanium based or fibre reinforced polymer material. A thermally sprayed coating of Hydroxy Apatite will be applied to root section 2; the properties of thermally sprayed Hydroxy Apatite are well documented, and serve to reduce the healing-in time period and also to promote a direct bond between the bone and the root section.

In the placement of dental implants utilising a root section in accordance with the invention, it is envisaged, due to the stepped tapered design, that the surgical placement kit will be relatively simple incorporating a water-irrigated pilot drill and a stepped tapered drill of appropriate dimensions. Staple gun introduction of the root section into an area where only the cortical bone has been removed may be a possibility in the case of a late implant. Of course, minimum preparation will be required

in the case of immediate replacement following the
extraction of a natural tooth. It is envisaged that
05 clinical prognosis for implantation will consider the same
indications currently identified.

The placement and use of root sections in accordance with
the invention in dental implantation will be readily
10 apparent to those skilled in the art, and therefore it is
not thought necessary, within this specification, to
describe their placement and use in greater detail.

15

20

25

CLAIMS:

- 05 1. A root section for a dental implant comprising a proximal neck portion having parallel-sided walls, an apex of hemi-spherical or truncated conical form, and an intermediate portion having a plurality of recesses of predetermined form.
- 10 2. A root section in accordance with Claim 1, wherein said intermediate portion is of tapered form.
- 15 3. A root section in accordance with Claim 1 or Claim 2, wherein said root section is cored.
- 20 4. A root section in accordance with Claim 3, wherein the core comprises an hexagonal portion and a threaded portion, or a bore for cement.
- 25 5. A root section in accordance with any of Claims 1 to 4, wherein said truncated conical apex has an inclusion angle of 100° to 150° , a flat of length 0.5mm to 1.5mm, and a base diameter lying in the range 2.0mm to 3.0mm.
6. A root section in accordance with any of Claims 1 to 4, wherein the hemi-spherical apex has a radius of

curvature lying in the range 0.5mm to 1.5mm.

05 7. A root section in accordance with any of Claims 1 to
6, wherein the intermediate portion includes one or more
anti-rotational slots.

10 8. A root section in accordance with any of the
preceding Claims, wherein the root section is composed of
a bio-compatible titanium based or fibre reinforced
polymer material.

15 9. A root section in accordance with Claim 8, wherein
the root section has a thermally sprayed coating of
Hydroxy Apatite.

20 10. A root section for a dental implant substantially as
herein described with reference to and as illustrated in
the accompanying drawings.

11. A root section for a dental implant substantially as
herein described.

25 12. A dental implant including a root section comprising
a proximal neck portion having parallel-sided walls, an
apex of hemi-spherical or truncated conical form, and an

intermediate portion having a plurality of recesses of predetermined form.

05

13. A dental implant including a root section substantially as herein described with reference to and as illustrated in the accompanying drawings.

10

14. A dental implant including a root section substantially as herein described.

15

20

25

Relevant Technical fields

- (i) UK Cl (Edition K) A5R (RDJ)
- (ii) Int Cl (Edition 5) A61C 8/00, 13/30

Search Examiner

L V THOMAS

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

25 MARCH 1992

Documents considered relevant following a search in respect of claims

1-14

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X Y	GB A 2210795 (BRISTOL-MYERS) - see line 17 page 7 - line 10 page 8 and Figures 2 and 13	1,3,4,12 2,7
Y	GB 1431563 (VITREDEMENT) - see lines 82-98 page 1 and Figures 1,2 and 6-8	2,7
X	EP A 0343135 (INST FOR APPLIED BIOTECH) - see lines 6-31 column 3 and Figure 1	1,3,8,12
X Y	US 4904187 (ZINGHEIM) - see line 35 column 3 - line 36 column 4, lines 63-64 column 4 and Figures 1 and 2	1,3-5,8 12 2,7
X	US 4723913 (BERGMAN) - see line 51 column 1 - line 10 and column 2 and Figures 2-5	1,3,8,12
X Y	US 4304553 (HEIMKE ET AL) - see lines 36-52 column 3 and the Figure	1,3,6,12 2,7

Category	Identity of document and relevant passages - 11 -	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☒ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☒ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER: _____**

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.